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Job Performance Report

Project F-53-R-13

LAKE AND RESERVOIR INVESTIGATIONS

Job XIV-b. Evaluation of Henrys Lake Management Program
Job XIV-c. Limnological Characteristics of Henrys Lake

by

John C. Coon
Senior Fishery Research Biologist

and

Analysis of Henrys Lake Cutthroat Trout

by

Richard C. Wallace
Department of Biological Sciences
University of Idaho

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TABLE OF CONTENTS

Page

Job XIV-b. Evaluation of Henrys Lake Management Program

ABSTRACT 1

RECOMMENDATIONS 3

INTRODUCTION 3

OBJECTIVES 3

TECHNIQUES USED 3

Hatchery Creek Spawning Run 3
Cutthroat Population Estimate 4
Sport Fishery 4
Fish Growth 4

FINDINGS 5

Hatchery Creek Spawning Run 5
Numbers, Size and Racial Distribution 5
Mortality Rates and Repeat Spawning 5
Growth of Repeat Spawners 8
Cutthroat Population Estimate 8
Hatchery Program 8
Sport Fishery 9
Angler Effort and Harvest 9
Fish Size 12
Fish Growth 12

DISCUSSION 12

Hatchery Creek Spawning Run 12
Sport Fishery 16
Fish Growth 20

CONCLUSION 20

LITERATURE CITED 21

LIST OF TABLES

Table 1. Number and estimated mean total length of cutthroat and hybrid trout counted in the Henrys Lake Hatchery spawning run, 1977 1/ 6

Table 2. Spot size and pattern displayed by cutthroat trout in the Hatchery Creek spawning run of Henrys Lake, 1977. . 7

LIST OF TABLES (Continued)

Page

Table 3 Estimated total angler hours, harvest and catch rates at Henrys Lake, 1977 10

Table 4. Estimated angler profile at Henrys Lake, 1977 11

Table 5. Mean total length and weight of cutthroat, hybrid and brook trout harvested from Henrys Lake, 1977..... 13

Table 6. Calculated mean total lengths and increments of growth for cutthroat trout sampled from angler creels on Henrys Lake, June-July, 1977 14

Table 7. Calculated mean total lengths and increments of growth for eastern brook trout sampled from angler creels on Henrys Lake, June-July, 1977 15

Table 8. Comparison of the age and length distributions of cutthroat in the Hatchery Creek spawning run in 1976 and 1977. Age groups are based on Coon (1978) . 17

Table 9. Comparison of the back-calculated total lengths of trout sampled from the Henrys Lake sport fishery in 1950-51 and 1977, sexes combined. Data for 1950-51 is due to Irving (1953) 18

LIST OF FIGURES

Figure 1. Mean total length of harvested cutthroat trout at Henrys Lake, 1976 and 1977, by monthly intervals 19

TABLE OF CONTENTS

Job XIV-c. Limnolo9ical Characteristics of Henrys Lake

ABSTRACT 22

RECOMMENDATIONS 23

OBJECTIVES 23

TECHNIQUES USED 23

FINDINGS 23

Water Temperature and Dissolved Oxygen Content 23
Plankton 26

TABLE OF CONTENTS (Continued)

Page

DISCUSSION 26

LITERATURE CITED 32

LIST OF TABLES

Table 1. Summer and fall water temperatures and dissolved oxygen content at three sample stations in Henrys Lake, 1977 (All samples taken from 0900-1200 4r) 27

Table 2. Winter water temperatures and dissolved oxygen content from sample stations in Henrys Lake, 1977-78 28

Table 3. Estimated relative plankton abundance at three sample stations in Henrys Lake during the summer of 1977 30

LIST OF FIGURES

Figure 1. Limnological sampling stations on Henrys Lake 24

Figure 2. Daily minimum and maximum water temperatures taken at weekly intervals in Henrys Lake at a depth of 1.25m (4.1 ft) i n front of hatchery cabin #2, 1977-78 25

Figure 3. Water temperature and dissolved oxygen content under the ice on Henrys Lake at 0.5 km (0.3 mi) SSW of hatchery cabin #2, 1977-78 29

TABLE OF CONTENTS

Analysis of Henrys Lake Cutthroat Trout

INTRODUCTION 33

TECHNIQUES USED 34

FINDINGS 34

ACKNOWLEDGEMENTS 40

LITERATURE CITED 41

LIST OF TABLES

Page

Table 1. Meristic characters of rainbow trout and Yellowstone cutthroat trout. Typical sample ranges and means (in parentheses) 35

Table 2. Meristic characters of Henrys Lake trout, 1970-1977 36

Table 3. Meristic characters from 5 rainbow trout from Henrys Fork, 1976 and a first generation hybrid taken in the spawning run, 1977 37

Table 4. Estimated meristic characters for "pure" Henrys Lake cutthroat trout based upon 20 selected fish, Henrys Lake, 1974-1977 38

JOB PERFORMANCE REPORT

State of Idaho Name: LAKE AND RESERVOIR INVESTIGATIONS

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Title: Evaluation of Henrys Lake Management Program

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ABSTRACT

From 9 March to 26 May 1977, we counted and marked 7,239 trout entering the Hatchery Creek spawning house (43.4% male). This was judged to be about 75% of the fish which attempted to enter the spawning house. The estimated mean total length and weight of the male cutthroat in the run was 463 mm (18.2 in) and 1,018 g (2.24 lb). Females averaged 456 mm (18.0 in) and 1,039 g (2.29 lb). Other than five fish which were judged to be first generation hybrids, all trout in the run showed predominantly cutthroat characteristics. Only 2% of the run were judged to have atypical cutthroat spotting patterns.

I estimated the total annual mortality rate for spawners in the 1976 spawning run from May 1976 to May 1977 at 73.2%. Only 1.4% of this mortality was due to the sport fishery. Three percent of the 1976 spawners were known to return to Hatchery Creek in 1977, These fish grew at an annual rate of about 37 mm (1.4 in) for males and 19 mm (0.8 in) for females. I estimated the population of cutthroat over 345 mm (13.6 in) in Henrys Lake near mid-June at 316,300 fish. This estimate assumes a 50% mortality rate for spawners prior to becoming available to the sport fishery.

Anglers fished an estimated 66,369 hours at Henrys Lake in 1977 to harvest 16,474 trout (29% brook trout). The mean season harvest rate was 0.25 trout per hour and the total catch rate 0.44 trout per hour. The exploitation rate on cutthroat appeared to be about 3% of the total population over 345 mm (13.6 in).

Nonresident anglers contributed 50% of the total angler effort at Henrys Lake. Boat anglers accounted for 95% of the angling effort and 98% of the harvest. Trolling was the most popular method of fishing and accounted for 52% of the effort while fly casters made up 32% of the season effort.

Cutthroat harvested in the 1977 sport fishery averaged 420 mm (16.5 in) and 908 g (2.00 lb) over the entire season. Brook trout averaged 362 mm (14.3 in) and 673 g (1.48 lb). Scale samples indicated that cutthroat trout reach an average length of 409 mm (16.1 in) by the end of their third year of life while brook trout average 356 mm (14.0 in) at that time.

The 1977 Hatchery Creek spawning run probably contained about 82% of the number of fish arriving i:n 1976, but showed a very significant increase in mean size. About 1.5% of the 1977 run were judged to be 5-year-olds compared to only 0.3% in 1976.

Fishing pressure in 1977 was within 3% of the 1976 estimate while the harvest was down 12%. Because of the increased percentage of brook trout in the harvest, the total number of brook trout harvested in 1977 actually increased over 1976. The total harvest rates for the 2 years were nearly identical, but the total catch rate in 1977 dropped by about 0.1 trout per hour. Low water made launching boats and fishing difficult during much of the latter half of the 1977 season.

The average size of cutthroat and brook trout harvested from Henrys Lake in 1977 was down slightly from 1976. However, the percentage of cutthroat over 500 mm (19.7 in) increased from 4 to 6% in 1977. Part of the decrease in mean size may be due to a larger percentage of the total season harvest occurring in May and June when mostly immature fish are harvested.

The growth rates of cutthroat and brook trout from Henrys Lake in 1977 appear to be equal to or greater than those calculated for fish caught in 1950-51.

Author:

John C. Coon
Senior Fishery Research Biologist

RECOMMENDATIONS

Continue monitoring the Hatchery Creek spawning run to determine significant changes in the number, mean size and racial characteristics of the cutthroat; and the return, growth rate and characteristics of the two hybrid crosses currently being produced,

Take advantage of the increased numbers of larger cutthroat in the spawning run to select only those fish greater than 500 mm (19.7 in) for the Henrys Lake parent stock.

Continue making all releases of hybrids and cutthroat from Hatchery Creek.

Continue the current trophy regulations on the sport fishery.

Hold the brook trout stocking level to about 100,000 fingerlings.

INTRODUCTION

This report continues the evaluation of the trophy management program initiated on Henrys lake in 1976. The only regulation changes made since that time are (1) deletion of the one-fish limit from 1 August to 15 September (i.e. a three-fish limit throughout the season) and (2) a requirement to cease fishing once the bag limit has been reduced to possession.

OBJECTIVES

To characterize the present condition of the Hatchery Creek spawning run with respect to abundance, average size of fish and racial integrity.

To determine the results of more restrictive regulations and an established stocking level on the sport fishery at Henrys Lake.

To evaluate the contribution of spawned cutthroat from Hatchery Creek to the sport fishery and subsequent spawning.

TECHNIQUES USED

Hatchery Creek Spawning Run

From 9 March through 26 May 1977, we marked all fish trapped in the Henrys Lake spawning house by punching a round hole in the dorsal lobe of the caudal fin with a standard paper punch. Prior to marking, the fish were anesthetized with either quinaldine or MS-222, and examined for previous marks and tags (Coon 1978). We measured the total length to the nearest lower 5 mm (0.2 in) of a random sample of about 25% of the fish and the weight to the nearest gram for 10% of the run. All fish measured were recorded separately by sex and most were classified by spotting pattern. All obvious first generation hybrids and noncutthroat trout were recorded separately.

I estimated the total annual mortality rate from May 1976 to May 1977 for cutthroat trout marked in the 1976 spawning run by utilizing the projected

harvest of marked fish in the 1976 and 1977 sport fisheries. The formula and procedure used, as provided by Ricker (1975), is:

$$S_1 = \frac{{}^{R}12\,{}^{M}2}{{}^{M}1\,{}^{R}22}$$

where $^{S}1$ is the survival rate during year 1 (from time of marking in year 1 to time of marking in year 2)

$^{M}1$ number of fish marked at the start of the first year

$^{M}2$ number of fish marked at the start of the second year

$^{R}11$ recaptures of first-year marks in the first year

$^{R}12$ recaptures of first-year marks in the second year

$^{R}22$ recaptures of second-year marks in the second year

and $^{1-S}1$ = Al the annual mortality rate in the first year

The number of fish, $^{M}2$, marked at the start of the second year, yields $^{R}22$ recaptures that year; thus the rate of exploitation in year 2 is $^{U}2=^{R}22/^{M}2$. Of the $^{M}1$ fish marked in year 1, $^{R}12$ are caught in year 2. The number of first-year marked fish still at large at the start of year 2 should be $^{R}12/^{U}2$, or $^{R}12\,{}^{M}2/^{R}22$ The latter number must be compared with the number of marked fish at large at the start of year 1, $^{M}1$, to obtain the survival rate over that period. This is the large-sample formula of Ricker.

Cutthroat Population Estimate

Following the same procedure as in 1976 (Coon 1978), I estimated the population of Henrys Lake cutthroat vulnerable to the sport fishery harvest in mid-June 1977.

Sport Fishery

I used the same methods employed in 1976 (Coon 1978) to estimate the angler effort and profile, and the species composition, average size and total number of trout harvested from Henrys Lake in 1977. More counts were made from shore with the aid of a spotting scope in 1977 than in 1976 when only binoculars were available.

Fish Growth

Because of the inherent variability in scale size and possible measurement errors, I used a functional regression to back-calculate the length at each annulus for the samples of cutthroat and brook trout taken from the sport fishery, Scales were removed from the second row above the lateral line near the origin of the dorsal fin and viewed on a scale projector at 47X. The total anterior scale radius and distance to each annulus was measured in millimeters.

Using Bartlett's three-group method for Model II regression, the functional linear relationship between the anterior scale radius and total length in millimeters of 32 cutthroat was found to be:

$$TL = 56.66 + 5.60\ ASR$$
$$\text{Approx. } r^2 = 0.88$$

The regression for a sample of 27 brook trout was:

$$TL = 24.22 + 8.29\ ASR$$
$$\text{Approx. } r^2 = 0.85$$

FINDINGS

Hatchery Creek Spawning Run

Numbers, Size and Racial Distribution

From 9 March through 26 May 1977, we counted and marked 7,239 trout entering the Hatchery Creek spawning house (43.4% male). Due to a greatly reduced request for eggs, the fish were processed at a much slower rate in 1977 than is normal. By the time I began running the fish through as fast as possible about the first of May, the ice had already broken up and many fish had left to ascend other streams. Therefore, it is likely that only about 75% of the fish which actually attempted to enter the spawning house were counted.

The estimated mean total length and weight of male cutthroat in the spawning run was 463 mm (18.2 in) and 1,018 g (2.24 lb) (Table 1). Females averaged 456 mm (18.0 in) and 1,039 g (2.29 lb). The observed range in size for all male cutthroat counted was 255 mm and 162 g (10.0 in and 0.36 lb) to 600 mm and 2,652 g (23.6 in and 5.85 lb). Female cutthroat ranged from 335 mm and 400 g (13.2 in and 0.88 lb) to 715 mm and 3,486 g (28.2 in and 7.69 lb). The largest fish observed in the run was a female cutthroat which did not appear to be fertile. The five first-generation hybrids counted in the run ranged from 330-490 mm (13.0-19.3 in). They were probably the result of natural crossbreeding by a very few remnant rainbow which escaped from the spawning house in 1975. Reports of some anglers releasing live rainbow into the lake from Henrys Fork have also been received.

A random sample of 1,669 trout, separated into the spot-size and pattern categories described by Coon (1978), indicated that 66% of the Hatchery Creek spawning run displayed a cutthroat spotting pattern which is quite characteristic of Henrys Lake cutthroat. Cutthroat with medium to large sized spots and the characteristic spotting pattern accounted for 64% of the sample. Only 2% of the trout sampled were judged to have an atypical cutthroat spotting pattern (Table 2).

Mortality Rates and Repeat Spawning

Using the large sample formula for annual survival rate (Ricker 1975), I estimated that the total annual mortality rate for the Hatchery Creek spawning run from May 1976 to May 1977 was 73.2%. The 1976 fishery exploitation rate of the total marked fish released in 1976 was 1.4%. Thus, the annual natural mortality rate was 71.8%. The exploitation rate of spawners by the 1977 sport fishery was estimated to be 1.3% (93 out of 7,239 marked fish). Thus, the total exploitation rate of the 1976 spawners by 2 years

Table 1. Number and estimated mean total length of cutthroat and hybrid trout counted in the Henrys Lake Hatchery spawning run, 1977.[1/]

Period of sampling	Trout counted			Cutthroat trout sampled			
					Mean total length (mm)		
	Males	Females	Total	Number	Males	Females	Total
9 Mar	492	164	656	175	473	459	470
15-18 Mar	422	372	794	204	464	458	461
24-25 Mar	262	351	613	169	457	464	461
5 Apr	142	287	429	124	467	457	460
11 Apr	85	209	294	83	464	462	463
15-22 Apr	342	600	942	241	462	454	457
29 Apr	210	283	493	128	458	459	459
6-7 May	259	487	746	211	454	454	454
9-10 May	248	513	761	207	456	450	452
13-15 May	462	541	1,003	281	466	455	460
17 May	163	217	380	102	464	451	457
26 May	56	72	128	35	474	469	471
Grand total and mean	3,143	4,096	7,239	1,960[2/]	463	456	459
			Range		275-560	335-530	275-560
			Standard deviation		41.19	22.63	32.20

[1/] Only five trout counted in the 1977 spawning run appeared to be first generation hybrids.
[2/] A random sample of 850 males and 1,110 females (27% of the total run).

Table 2. Spot size and pattern displayed by cutthroat trout in the Hatchery Creek spawning run of Henrys Lake, 1977.

Classification	Number of fish	Percent of fish
Large spots (L)	733	44
Medium Spots (M)	885	53
Fine Spots (F)	51	3
Characteristic cutthroat pattern (H)	1,109	66
Intermediate cutthroat pattern (Y)	533	32
Atypical cutthroat pattern (X)	27	2
LH	465	28
MH	606	36
FH	38	2
LY	253	15
MY	268	16
FY	12	1
LX	15	1
MX	11	1
FX	1	<1

of fishing was 1.7% (209 out of 12,190 marks released).

Of the 12,190 spawners marked in 1976, 367 (3.0%) were counted in the Hatchery Creek spawning house in 1977. Males returned at a rate of 3.8% and averaged 462 mm (18.2 in) in length. Females returned at a rate of 2.1% and averaged 472 mm (18.6 in). These fish comprised 5.1% of the total 1977 run.

If 73.2% of the 1976 spawners died or were caught in the sport fishery prior to the 1977 spawning run (as estimated above), then 11.2% of the surviving 1976 spawners returned for another spawning in 1977. If we counted only 75% of the actual run in Hatchery Creek **in** 1977, then I could have expected to find 492 (15.1%) of the surviving 1976 spawners returning in 1977. Additionally, a sample of 115 spawners in Targhee Creek showed that 5% of these fish were 1976 spawners in Hatchery Creek which were not marked in the 1977 Hatchery Creek run. While some of these fish might have been part of the estimated 25% not counted in Hatchery Creek in 1977, there is still an indication that the percentage of repeat spawners could be higher than indicated by the return to Hatchery Creek alone.

Growth of Repeat Spawners_

Five male cutthroat, 385-410 mm (15.2-16.1 in) in length in the 1976 spawning run, were found to have grown at a mean rate of 46 mm (1.8 in) per year between the 1976 and 1977 spawning runs. Seven males, 415-535 mm (16.4-21.1 in) in length **in** 1976, grew at an average annual rate of 30 mm (1.2 in). Mature females appeared to grow more slowly. Four females from 430-450 mm (16.9-17.7 in) in 1976 grew at a mean annual rate of only 19 mm (0.7 in).

Cutthroat Population Estimate

Using the marked fish from the 1977 spawning run and a postulated mortality rate of 50% for spawning fish prior to becoming available to the sport fishery, I estimated that there were 316,300 cutthroat trout over 345 mm (13.6 in) long in Henrys Lake at mid-June. The 95% confidence interval for this estimate is 196,153 to 538,379.

Hatchery Program

Approximately 835,000 cutthroat fry were released into Hatchery Creek by mid-September 1977. The male parents of these fish averaged about 470 mm (18.5 in) in length while the female parents averaged about 460 mm (18.1 in). About 31% of the fish released came from eggs fertilized prior to mid-April while 36% were fertilized on 10 May and 33% on 27 May 1977.

The 200,200 rainbow-cutthroat hybrids released into Henrys Lake via Hatchery Creek in 1977 were again produced by two separate crosses. One-half of these fish were the result of fertilizing Henrys Lake cutthroat eggs with steelhead sperm obtained from Dworshak National Hatchery. The other half were obtained by fertilizing cutthroat eggs with Henrys Fork rainbow sperm. The male parents of the steelhead cross averaged 813 mm (32.0 in) and the female cutthroat 473 mm (18.6 in). The male Henrys Fork rainbow averaged 371 mm (14.6 in) and the cutthroat females in this cross had a mean length of 466 mm (18.4 in). One-half of the steelhead crossed

progeny were marked with a right ventral clip and one-half of the Henrys Fork rainbow cross were marked with a left ventral clip.

In addition to the cutthroat and hybrids, about 137,000 eastern brook trout fingerlings were released in protected locations around the lake.

Sport Fishery

From 28 May to 31 October 1977, we obtained angler interviews covering 11,068 hours of fishing at Henrys Lake. This was 17% of the total estimated angler hours expended there in 1977,

Angler Effort and Harvest

Anglers spent an estimated 66,369 hours fishing at Henrys Lake during the 1977 season. The most concentrated effort occurred on opening weekend when as many as 373 anglers were counted at one time (no count outside of opening weekend ever exceeded 110 anglers). Fishing pressure decreased significantly after June and again after July when low water made launching large boats very difficult.

During the season, anglers harvested an estimated 16,474 trout. This harvest consisted of 11,702 (71%) cutthroat, 65 (<1%) rainbow-cutthroat hybrids, 4,699 (29%) eastern brook trout and 8 rainbow (<1%). The mean harvest rate for the entire season was 0.25 trout per hour. Counting fish caught and released, the mean season catch rate was 0.44 trout per hour (Table 3).

Based on the estimated cutthroat harvest after mid-June (8,305) and my population estimate of 316,300 cutthroat over 345 mm (13.6 in) in Henrys Lake at mid-June, it would appear that anglers harvested about 3% of these fish in 1977.

Resident anglers living within 161 km (100 mi) of Henrys Lake accounted for 28% of all anglers interviewed. They were most prevalent during the opening and closing census intervals. Nonresident anglers accounted for 50% of the total angler effort and were the largest user group from July to mid-October.

Boat anglers accounted for 95% of the total angling effort and harvested 98% of the total catch. Bank anglers, who accounted for 4% of the fishing effort, were most numerous during the last 2 weeks of the season and also had their best angling success at that time. Overall, they harvested a little over 1% of the catch. Anglers utilizing tubes made up 1% of the total fishing effort and harvested less than 1% of the total catch.

Trolling was the most popular method of fishing, especially during the first month-and-a-half of the season. Trollers accounted for 52% of the angler effort. Fly casting dominated the other methods from mid-July till the end of September and made up 32% of the season effort. Fifty percent of the total season harvest occurred from opening day to 25 June when 89% of the anglers were trollers (Table 4).

Table 3. Estimated total angler hours, harvest and catch rates at Henrys Lake, 1977.

Census interval	Angler hours	Trout harvested[1/]							Trout released	Total trout/hr
		Cut	Ad-Cut	Cd-Cut	Hyb	Brook	Total	Total/hr		
5/28-6/10	15,140	3,379	0	18	0	1,289	4,686	0.31	409	0.34
6/11-24	12,540	2,693	0	5	5	835	3,538	0.28	807	0.35
6/25-7/8	9,598	1,027	10[2/]	14	5	295	1,351	0.14	1,139	0.26
7/9-22	7,192	471	0	0	0	434	905	0.13	1,013	0.27
7/23-8/5	3,792	366	16	0	5	270	657	0.17	1,515	0.57
8/6-19	2,992	232	3	0	0	311	546	0.18	1,110	0.55
8/20-9/2	2,096	444	9	12	0	140	605	0.29	1,977	1.23
9/3-16	3,206	455	4	21	4	212	696	0.22	1.814	0.78
9/17-30	2,381	502	0	8	4	231	745	0.31	1,754	1.05
10/1-14	3,441	926	0	0	7	205	1,138	0.33	787	0.56
10/15-31	3,991	1,078	0	9	35	477	1,599	0.40	368	0.49
Total	66,369	11,573	42[2/]	87	65	4,699	16,4661[3/]	0.25	12,693	0.44

[1/] Cut = Unmarked cutthroat
Ad-Cut = Adipose clipped cutthroat from 1976 spawning run
Cd-Cut = Caudal punched cutthroat from 1977 spawning run
Hyb = First generation progeny of a cutthroat-rainbow cross
Brook = Eastern brook trout

[2/] Six of these fish also had caudal punches

[3/] An additional 8 rainbow were estimated in the harvest which are not included in this total.

Table 4. Estimated angler profile at Henrys Lake, 1977.

Census intervals	Resident		Percent of anglers						
	Within 100 mi	Total	Fishing from			Trolling	Casting		
			Boat	Bank	Tube		Bait	Lures	Flies
28 May-10 Jun	47	77	95	5	0	92	6	0	2
11 Jun-24 Jun	17	52	98	2	<1	85	2	2	11
25 Jun-8 Jul	14	39	92	3	5	47	9	4	40
9 Jul-22 Jul	10	40	94	3	3	19	11	6	64
23 Jul-5 Aug	12	25	96	2	2	9	24	6	61
6 Aug-19 Aug	9	38	97	3	<1	0	14	6	80
20 Aug-2 Sep	7	23	99	<1	<0.5	1	15	2	82
3 Sep-16 Sep	8	30	98	<1	1	6	13	9	73
17 Sep-30 Sep	11	30	94	3	3	5	2	45	48
1 Oct-14 Oct	25	29	96	4	0	46	4	21	29
15 Oct-31 Oct	75	81	89	11	0	28	28	32	12
All[1/]	28	50	95	4	1	52	9	7	32

[1/] Weighted by angler hours for each interval

Fish Size

The average size of cutthroat trout harvested from Henrys Lake in 1977 was least in May, June and July; peaked **in** late August and early September, and then decreased slightly for the rest of the season. The early fishery utilizes primarily the immature stock of cutthroat which have not been engaged in spawning, while the later fishery is more selective toward post spawning fish. On the average, harvested brook trout were largest in August and early September when mature fish began to congregate at stream mouths prior to spawning.

Cutthroat entered the harvest during the opening month of the season at an estimated mean length of 400 mm (15,7 in) and a mean weight of 817 g (1.80 lb). The average size peaked in late August and early September when the cutthroat averaged 463 mm (18.2 in) and 1,107 g (2.44 lb). The season average, weighted by the estimated harvest during each census period, was 420 mm (16.5 in) and 908 g (2.00 lb). The largest cutthroat measured in the 1977 harvest was 660 mm (26.0 in) in length and weighed about 3,100 g (6.8 lb). The smallest cutthroat was 225 mm (8.9 in) long and weighed 110 g (0.24 lb) (Table 5).

The percentage of harvested cutthroat under 355 mm (14.0 in) was 13.1%, of which 79% were harvested prior to 25 June. Only 1.9% of all the cutthroat were less than 305 mm (12.0 in). At the trophy end of the scale, 6.0% of the cutthroat harvest was greater than 500 mm (19.7 in).

Over the entire season, brook trout averaged 362 mm (14.3 in) in length and 673 g (1.48 lb) in weight. The largest brook trout recorded in the census was 520 mm (20.5 in) long and weighed 1,990 g (4.39 lb).

Only 15 first generation hybrids were measured during the creel census. They averaged 339 mm (13.4 in) and 457 g (1.01 lb). None were of exceptional size and no marked hybrids were found.

Fish Growth

The small sample of scales from selected cutthroat in the 1977 sport fishery harvest indicated excellent growth for cutthroat from Henrys Lake. It indicated that cutthroat reach an average length of 409 mm (16.1 in) by the end of their third year of life and 466 mm (18.4 in) at the end of the fourth year (Table 6).

Brook trout also showed excellent growth, reaching 356 mm (14.0 in) by the end of their third year and 425 mm (16.7 **in)** at the end of the fourth. Unfortunately, very few brook trout presently live past 4 years of age in Henrys Lake (Table 7).

DISCUSSION

Hatchery Creek Spawning Run

The number of trout returning to Hatchery Creek in 1977 appeared to be similar to that counted in 1976. A decreased demand for eggs and an early break-up of ice on the lake precluded an accurate count of all fish entering

Table 5. Mean total length and weight of cutthroat, hybrid and brook trout harvested from Henrys Lake, 1977.

Census intervals	Cutthroat		Hybrid		Brook trout	
	Mean TL(mm)	Mean Weight(g)	Mean TL(mm)	Mean weight(g)	Mean TL(mm)	Mean weight(g)
28 May-24 Jun	400 (812)*	817 (301)	400 (1)	744 (1)	361 (260)	666 (89)
25 Jun-22 Jul	412 (224)	841 (137)	413 (2)	775 (2)	361 (102)	697 (81)
23 Jul-19 Aug	455 (101)	1,092 (85)	415 (1)	760 (1)	388 (88)	803 (70)
20 Aug-16 Sep	463 (191)	1,107 (154)	390 (1)	600 (1)	384 (69)	819 (61)
17 Sep-14 Oct	449 (165)	1,053 (153)	290 (2)	400 (1)	331 (51)	470 (50)
15 Oct-31 Oct	447 (120)	1,039 (111)	319 (8)	329 (7)	338 (68)	508 (66)
A11[1/]	420 (1,613)	908 (941)	339 (15)	457 (13)	362 (638)	673 (417)

[1/] Weighted by the estimated harvest during each interval

* Sample size

Table 6. Calculated mean total lengths and increments of growth for cutthroat trout sampled from angler creels on Henrys Lake, June-July, 1977.

Age class	Number of fish	Mean TL at capture (mm)	Calculated mean total length (mm) at annulus				
			1	2	3	4	5
I	3	262	180				
II	11	354	152	308			
III	9	461	145	289	419		
IV	8	515	137	288	399	465	
V	1	650	129	258	393	477	533
Weighted mean length			148	295	409	466	533
Increment of growth			148	147	114	57	67
Equivalent total length (in)			5.8	11.6	16.1	18.4	21.0
Number of fish			32	29	18	9	1

Table 7. Calculated mean total lengths and increments of growth for eastern brook trout sampled from angler creels on Henrys Lake, June-July, 1977.

Age class	Number of fish	Mean TL at capture (mm)	Calculated mean total length (mm) at annulus			
			1	2	3	4
I	4	230	126			
II	14	343	132	262		
III	6	440	125	223	360	
IV	3	492	121	218	348	425
Weighted mean length			128	246	356	425
Increment of growth			128	118	110	69
Equivalent total length (in)			5.0	9.7	14.0	16.7
Number of fish			27	23	9	3

the spawning ladder in 1977. However, I estimate the return at about 10,000 fish (9,652). This compares to 12,190 in 1976. The estimated decrease consisted mostly of male cutthroat as only 43% of the 1977 run were males compared to 56% in 1976.

A very significant increase **in** the mean size of cutthroat was evident in the 1977 run. Male cutthroat averaged 34 mm (1.3 in) longer and 205 g (0.45 lb) heavier than in 1976 while female cutthroat showed an increase of 13 mm (0.5 in) and 99 g (0.22 lb). The increased size came mainly in the form of increased percentages of 4- and 5-year-old males and 4-year-old females (Table 8).

The racial characteristics of the 1977 spawning run, in terms of spot size and pattern, did not change appreciably from the 1976 sample. There was some indication of less hybridism as the percentage of atypical cutthroat spotting patterns dropped from 5% to 2%. Again, it should be emphasized that these classifications are relatively subjective and may vary slightly from year to year.

Sport Fishery

The 66,369 hours of total angler effort estimated for 1977 was 1,740 hours or 3% less than the effort estimated for 1976. If low water had not made launching boats and fishing fairly difficult and limited after 1 August, the 1977 effort may have exceeded that of 1976. The total 1977 harvest was down 2,184 trout or 12% from 1976. In terms of trout harvested per hour, however, there was little difference between the 2 years (0.27 in 1976 to 0.25 in 1977). The two obvious differences between 1976 and 1977 were in the total catch rates and the species composition of the harvest.

Brook trout provided 29% of the 1977 harvest compared to 19% in 1976. This meant that while the total 1977 harvest was down about 2,200 fish from 1976, the harvest of cutthroat was down by 3,400 fish while the number of brook trout actually increased by 1,200 fish.

While low, clear water during the latter half of the 1977 season made fishing more difficult than in 1976, the 1977 harvest rate did not show a significant decrease. This was due to the one-fish limit during the same **period in** 1976 which kept the harvest rate low in that year. However, the decrease did become evident in the total catch rate (including fish caught-and-released) which dropped about 0.1 trout per hour. The 1976 and 1977 population estimates of trout over 345 mm (13.6 in) were nearly identical for both years, indicating a change in fishing efficiency rather than a decrease in fish available.

The angler profile at Henrys Lake in 1977 was nearly identical with that of 1976. Nonresidents again comprised 50% of the angler public. Bank and tube anglers decreased slightly, mostly due to low water and weedy conditions. As a larger percent of the angler effort occurred in May and June in 1977, trolling showed a slight increase over bait and lure casting. The percentage of fly casters was identical with that of 1976.

While the mean total length of cutthroat in the harvest did not show an increase over 1976, I believe this reflects a change in the harvest pattern

Table 8. Comparison of the age and length distributions of cutthroat in the Hatchery Creek spawning run in 1976 and 1977. Age groups are based on Coon (1978).

Age [1/]	Percent of run for all cutthroat		Males			Females		
	1976	1977	Length range(mm)	Percent of run 1976	1977	Length range(mm)	Percent of run 1976	1977
2	0.1	0.8	250-325	0.2	1.9	4320	0	0
3	39.5	9.2	330-430	54.4	13.3	320-420	20.4	6.0
4	60.1	88.4	435-520	45.0	81.5	425-520	79.4	93.8
5 and over	0.3	1.5	>520	0.3	3.3	>520	0.2	0.2

[1/] The number of annuli which would be completed by June, 1975.

Table 9. Comparison of the back-calculated total lengths of trout sampled from the Henrys Lake sport fishery in 1950-51 and 1977, sexes combined. Data for 1950-51 is due to Irving (1953).

Species	Sample year(s)	Total no. sampled	Calculated mean total length(mm) at annulus				
			1	2	3	4	5
Cutthroat	1950-51	363	132	292	417	500	533
	1977	32	148	295	409	466	533
Brook	1951	34	112	216	328	419	-
	1977	27	128	246	356	425	-

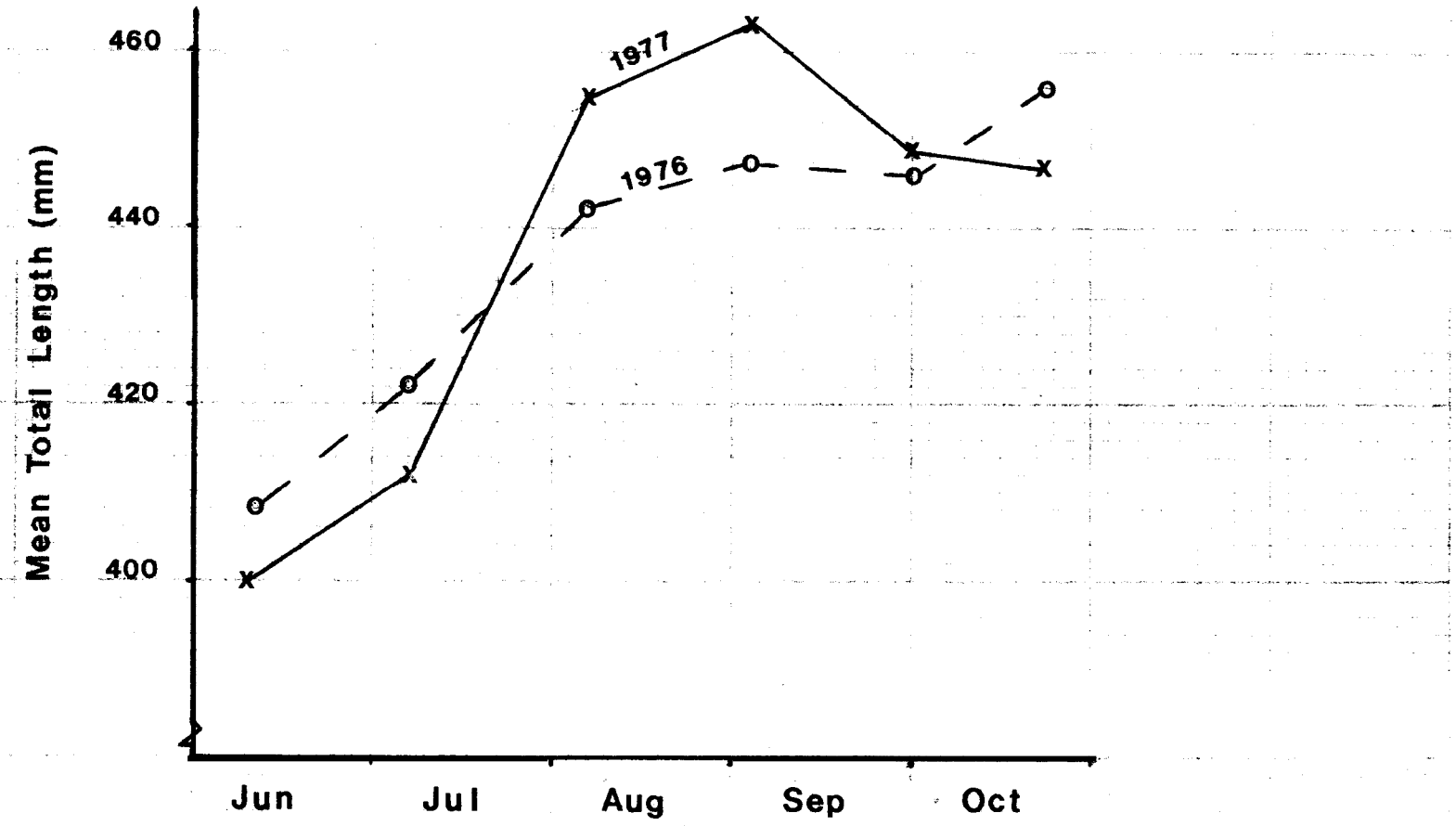

Figure 1. Mean total length of harvested cutthroat trout at Henrys Lake, 1976 and 1977, by monthly intervals.

and natural variation in yearly growth rates rather than a lack of larger fish under the trophy regulations. Fifth-two percent of the cutthroat harvest in 1977 occurred prior to 25 June, In 1976 only 37% of the harvest was taken during this time. As stated earlier, the average size of cutthroat harvested from Henrys Lake increases with the season, so that the higher percentage of fish caught in the latter half of the season, the greater the average size of the total harvest (Fig. 1). While the mean total length of the cutthroat harvest did not increase in 1977, the percentage of cutthroat over 500 mm (19.7 in) increased from 4.0% to 6.0%.

The average size of brook trout in the 1977 harvest also showed a slight decrease from 1976 (371 mm in 1976 to 362 mm in 1977). This decrease may simply reflect the greater numbers of smaller brook trout available after the initiation of stocking in 1975. As will be seen later, the growth rates of the brook trout and cutthroat as well, do not seem to show any reduction which might be ascribed to competition among the greater numbers of fish present.

Fish Growth

The back-calculated lengths of the small sample of cutthroat trout taken from the 1977 sport fishery indicated excellent growth and compared favorably with back-calculations for Henrys Lake cutthroat in the 1950-51 sport fishery (Irving 1953). The growth rate of brook trout in 1977 also appears to be as good or better than that calculated from a sample in 1951 (Table 9).

CONCLUSION

The trophy regulations for Henrys Lake appear to be working toward maintaining a greatly reduced fishing pressure and harvest as well as providing a greater percentage of trophy cutthroat. The number of trophy fish in the harvest should be increased when the hybrids begin reaching trophy size in late 1979.

The regulations appear to be shifting more of the harvest to May and June when mostly immature fish are caught. At the present level of harvest, this is probably the best time to remove these fish as they have excellent flesh quality and later loss to natural mortality will only increase as the fish mature. Thus, at the present harvest level, Henrys Lake appears to be satisfying an intensely consumptive fishery during Many and June as well as building a reserve of trophy-sized fish for a much less consumptive fishery over most of the remaining season.

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JOB PERFORMANCE REPORT

State of Idaho Name: LAKE AND RESERVOIR INVESTIGATIONS

Project No. F-53-R-13 Title: Limnological Characteristics of Henrys Lake

Job No. XIV-c.

Period Covered: 1 March 1977 to 28 February 1978

ABSTRACT

Though the 1976-77 winter snowfall was well below normal in Island Park, trout survival in Henrys Lake was not adversely effected during the summer and early winter of 1977. Heavy spring rains, a cooler than normal summer and a near capacity carry-over of water from 1976 combined to keep the trout habitat from deteriorating seriously.

The ice went out on 30 April at Henrys Lake in 1977. At no time did the dissolved oxygen content in areas of fish concentrations drop below 3-4 ppm prior to the spring thaw and no unusual winter mortality was observed. The oxygen tension remained at or above saturation at all depths during the open water period and temperatures were well within the range of trout tolerance.

After the ice cover was complete in the fall, the oxygen tension of the water began to decrease slowly. By the end of December, the dissolved oxygen content 0.5 km (0.3 mi) SSW of the hatchery ranged from 4 ppm at the bottom, 4 m (13 ft), to 12 ppm immediately beneath the ice. Near the end of March, the oxygen content had decreased to a range of 0.4-3.0 ppm. However, the valves near the hatchery diffuser pipe, where fish were congregated, were in the range of 4-6 ppm.

Daphnia were the most abundant form of zooplankton sampled from the lake and peaks of abundance occurred in June and late August. The usually dense blooms of the blue-green algae Gloeotrichia and Aphanizomenon were much reduced this year.

Despite the drought, Henrys Lake entered the winter freeze-up with considerably more water storage than in several earlier years, notably 1961, 1966 and 1967. This fairly adequate storage and light phytoplankton bloom should help prevent undue winter mortality.

Based on dissolved oxygen levels in areas of fish concentrations in late March, it appears that•no unusually high winter mortality should occur prior to the spring thaw in 1978.

Author:

John C. Coon
Senior Fishery Research Biologist

RECOMMENDATIONS

Continue monitoring the limnological conditions of the lake, especially during the winter.

Standardize the sampling program to make future comparisons more valuable.

OBJECTIVES

To monitor the water temperature and dissolved oxygen levels in Henrys Lake in order to discover possible problems for fish survival under the new management plan.

To monitor the plankton population of Henrys Lake.

TECHNIQUES USED

Using the same sample stations established in 1976 (Coon 1978), I obtained temperature, dissolved oxygen and plankton samples at approximately monthly intervals during the open water period on Henrys Lake (Fig. 1). During the winter I took water samples through the ice about 0.5 km (0.3 mi) SSW of hatchery cabin #2 and near areas of heavy fish concentrations at the mouth of Hatchery Creek and Staley Springs.

Water samples were taken as in 1976 with a 1.2 1 (0.3 gal) Kemmerer water sampler and using a mercury thermometer to record temperatures and a Hach Kit for oxygen determinations. A Moeller recording thermograph recorded water temperatures in the lake in front of the fish hatchery at a mean depth of 1 m (3.3 ft).

Plankton samples were taken in a vertical tow from the bottom to the surface with a conical plankton net which had a mouth 15 cm (5.9 in) in diameter and #10 mesh. At least two and sometimes three replications were made of each tow and the counts from these samples averaged for a quantitative determination. All counts were made on a 1-mi aliquot of the concentrated sample in a Sedgewick-Rafter counting cell.

FINDINGS

Heavy spring rains, a cooler than normal summer and a near capacity carry-over storage from 1976 combined to keep Henrys Lake in relatively good shape this year despite an abnormally low snowfall during the previous winter. The lake was at or near capacity during the entire month of June, 5.18 m (17.0 ft) on the dam gage, and reached a low of 3.63 m (11.9 ft) on 8 September before again rising to 3.75 m (12.3 ft) prior to winter freeze-up.

Water Temperature and Dissolved Oxygen Content

In 1977, the winter ice cover was completely gone on 30 April. Within 1 month, the daily maximum water temperature was reaching 14.4 C (58 F) while the daily minimum was 11.7 C (52 F). Water temperatures in the lake peaked just after mid-July when they reached a daily maximum of 24.4 C (76 F) and a daily minimum of 19.4 C (67 F). The decline in water temperature was rapid and nearly constant from early September till 18 November when ice cover on the

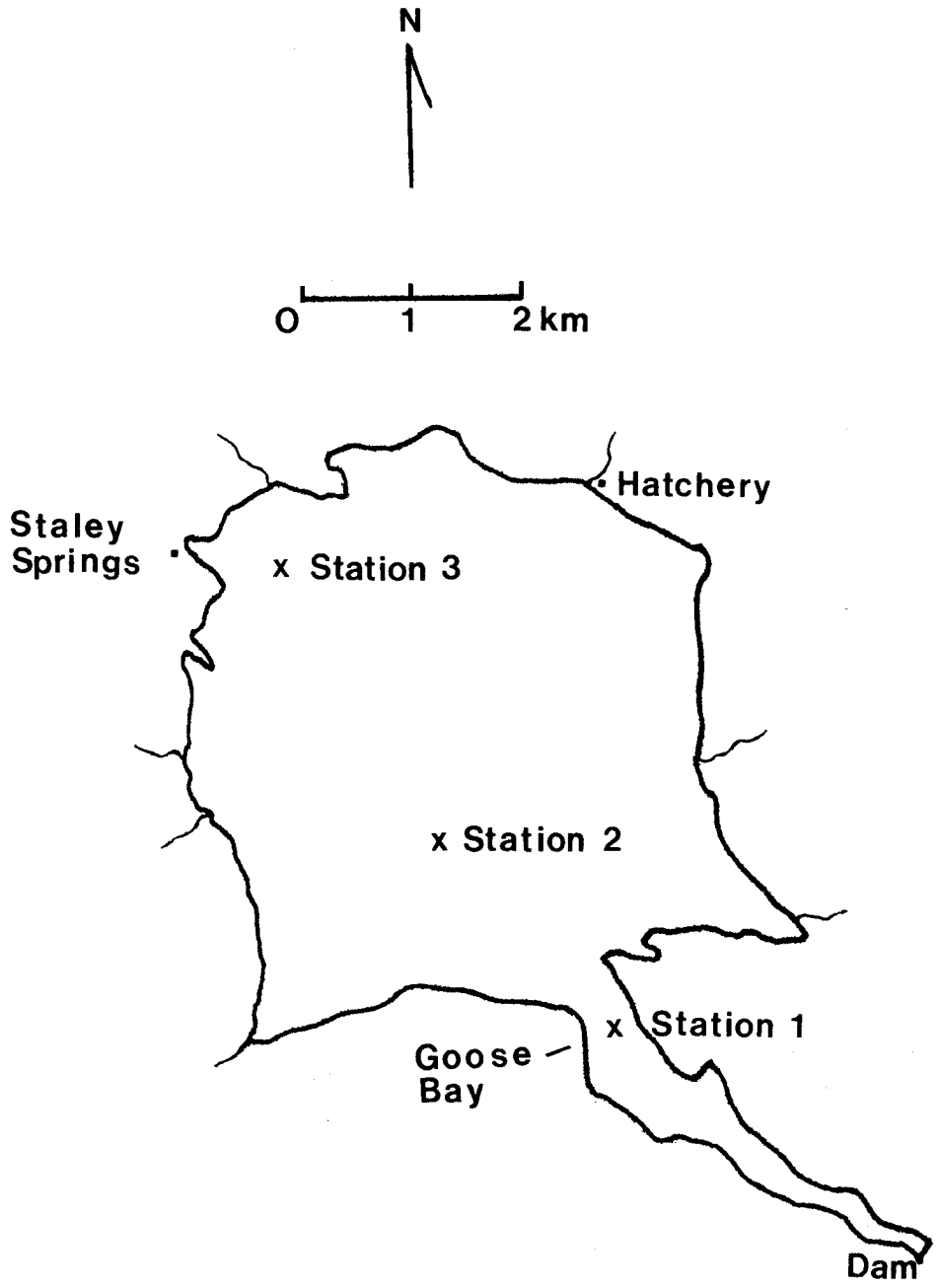

Figure 1. Limnological sampling stations on Henrys Lake.

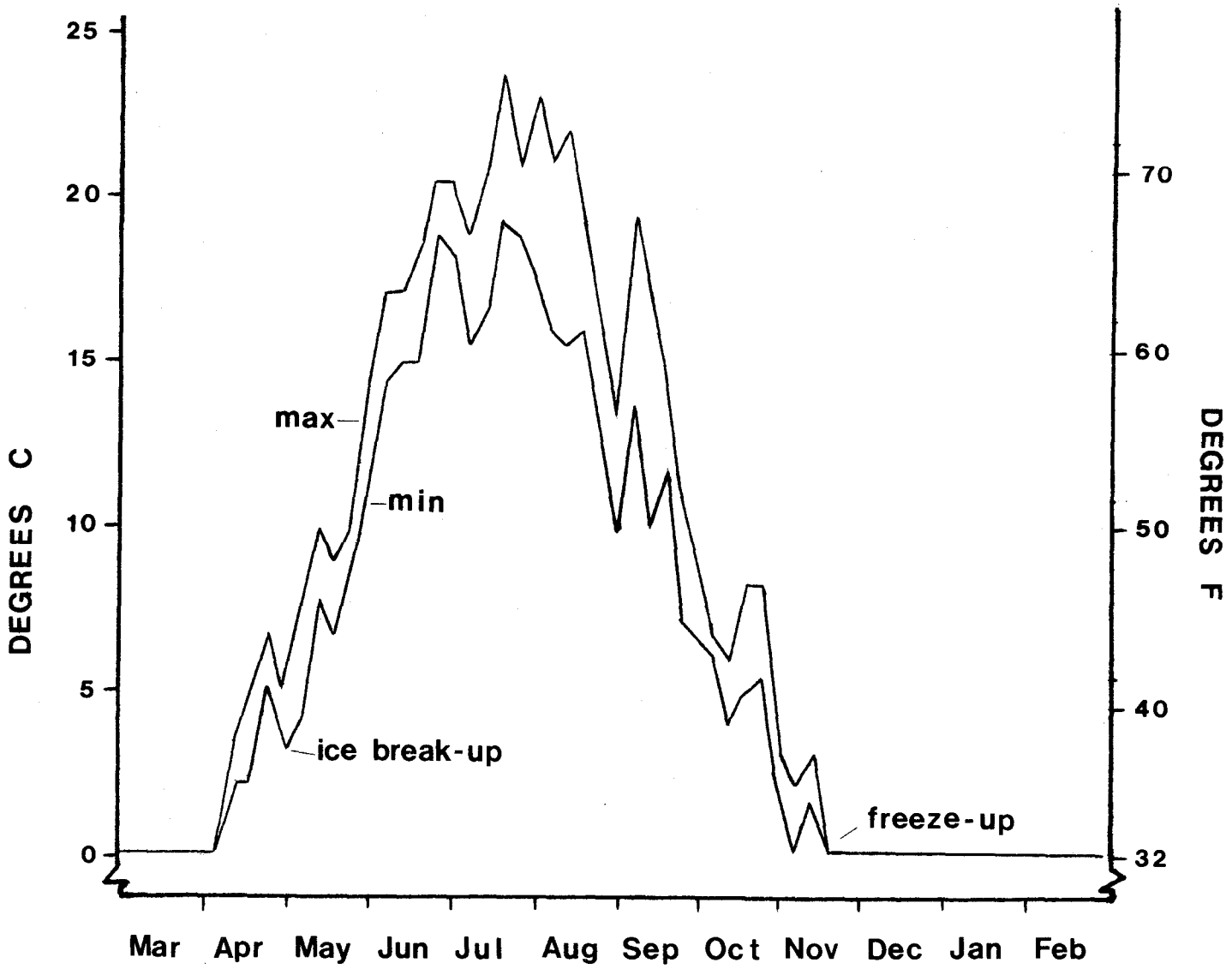

Figure 2. Daily minimum and maximum water temperatures taken at weekly intervals in Henrys Lake at a depth of 1.25 m (4.1 ft) in front of hatchery cabin #2, 1977-78.

lake was again complete (Fig. 2).

It is unlikely that the oxygen content of the lake in areas of large fish concentrations ever dropped below 3-4 ppm prior to the break-up of ice on 30 April 1977 and no signs of unusual winter fish mortality were observed. Immediately after the spring thaw, the lake became saturated with oxygen at all depths and remained so with little significant variation throughout the open water season (Table 1).

After ice cover was complete in the fall of 1977, the oxygen tension of the water began to decrease slowly. Near the end of December, samples taken 0.5 km (0.3 mi) SSW of the hatchery showed that the oxygen content ranged from 4 ppm at the bottom, 4 m (13 ft) to 12 ppm immediately beneath the ice. By the end of March, oxygen content at this same station ranged from 0.4-3.0 ppm. Similar conditions were found to exist under the ice near Staley Springs. Undoubtedly, the oxygen content near mid-lake was even less; however, the fish do not winter in that area. It should be noted that at the same time oxygen tension was less than 1 ppm at the bottom under the ice at 0.5 km (0.3 mi) SSW of the hatchery, it was 4.5 ppm near the diffuser pipe at the mouth of Hatchery Creek where fish were concentrated (Table 2, Fig. 3).

Plankton

Daphnia was the most abundant zooplanktor found throughout the lake and also had the greatest biomass. Peaks of abundance during the sample period occurred in June and late August. Diaptomus and Cyclops were present in lesser numbers and were least abundant in mid-lake (Table 3).

The blue-green algae Gloeotrichia and Aphanizomenon were again the dominant phytoplankton forms in Henrys Lake. Gloeotrichia bloomed near the first of August, but never reached the abundance level of 1976. Aphanizomenon was not present until after mid-August and bloomed in early September, but at a much reduced level from 1976 (Table 3).

DISCUSSION

The 1977 drought had little effect on the summer, fall and early winter survival of trout in Henrys Lake. Heavy spring rains filled the reservoir in June and the storage level was at 3.75 m (12.3 ft) on the dam gage and rising slowly at the time of freeze-up in mid-November (approximately 78.9 cu hm or 64,000 acre-ft of storage). This was 23.8 cu hm (19,300 acre-ft) more than at the same time in 1961 and considerably more than several other years, among them 1966 and 1967. Prior to 1961, leaks in the dam resulted in generally low over-winter storage levels.

The cool summer, minimal surface and subsurface runoff, dilution of the lake with very heavy late spring rains and rapid draw-off of water after mid-summer kept the bloom of blue-green algae in Henrys Lake at a minimum. Unlike 1976, the lake waters remained clear throughout the summer rather than taking on the green color of the algae blooms. Submergent vegetation became very thick, however, and was a severe nuisance to most fishermen. The plant growth appeared to be heavier than in 1976, but part of this appearance may have been due to the lower water level.

Table 1. Summer and fall water temperatures and dissolved oxygen content at three sample stations in Henrys Lake, 1977 (all samples taken from 0900-1200 hr).

		Goose Bay		Mid-lake		Near Staley Springs	
Date	Depth	Temp. (C)	D.O. (ppm)	Temp. (C)	D.O. (ppm)	Temp. (C)	D.O. (ppm)
6/20	Surface	17.2	8.0	16.7	8.5	16.7	9.5
	Mid-depth	17.2	8.0	16.7	8.5	16.7	9.5
	Bottom	16.7	7.0	16.7	8.5	15.6	8.5
8/2	Surface	20.0	11.0	20.0	10.0	20.6	14.0
	Mid-depth	19.4	11.0	18.9	9.0	17.8	9.0
	Bottom	18.9	9.0	18.9	9.0	15.0	12.0
8/31	Surface	12.2	8.0	13.9	8.0	12.2	9.0
	Mid-depth	12.2	8.0	13.3	8.0	11.7	8.5
	Bottom	12.2	8.0	13.3	9.0	11.1	9.0
9/21	Surface	11.1	10.0	12.2	7.0	11.1	10.0
	Mid-depth	11.1	10.0	12.2	7.0	11.1	9.0
	Bottom	11.1	10.0	12.2	8.0	11.1	9.0

Table 2. Winter water temperatures and dissolved oxygen content from sample stations in Henrys Lake, 1977-78.

Date	Sample location	Snow (m)	Ice (m)	Water Depth (m)	Water Temp. (C)	Water D.O. (ppm)
3/7/77	0.3 km E of Staley Springs	0.30	0.60	1.50	1.0	7.0
				3.00	2.0	6.0
3/7/77	1.0 km E of Staley Springs	0.25	0.40	2.00	1.5	9.0
				4.50	3.0	4.0
3/7/77	Mid-lake	0.20	0.60	2.50	2.0	10.0
				5.00	4.0	1.0
12/21/77	0.5 km SSW of hatchery	0.03	0.30	1.00	0.5	12.0
				1.75	1.1	11.0
				3.50	2.2	4.0
1/3/78	0.5 km SSW of hatchery	0.25	0.50	1.00	1.7	11.0
				2.00	2.2	6.0
				4.00	2.8	2.0
2/19/78	0.5 km SSW of hatchery	0.30	0.60	1.00	0.5	9.5
				2.00	1.1	5.5
				4.00	2.2	0.8
2/14/78	50 m SSW of Hatchery Creek mouth	0.20	0.70	1.00	0.5	6.5
				2.25	0.5	4.5
3/7/78	0.5 km SSW of hatchery	0.20	0.80	1.25	0.5	6.0
				2.25*	1.1	1.2
				4.25**	2.8	0.4
3/8/78	In Staley Springs	0.0	0.0	1.25	6.7	7.5
				2.25	6.7	7.5
3/8/78	0.2 km E of Staley Springs	0.20	0.80	2.00*	1.7	0.6
				2.75**	2.8	0.6
3/28/78	o.5 km SSW of hatchery	0.0	0.90	1.50	2.2	2.5
				2.50	2.2	3.0
				4.25*	3.9	0.4

*A faint odor of escaping gas (presumably methane) was present in these samples.

**A strong odor of escaping gas (presumably methane) was present in these samples.

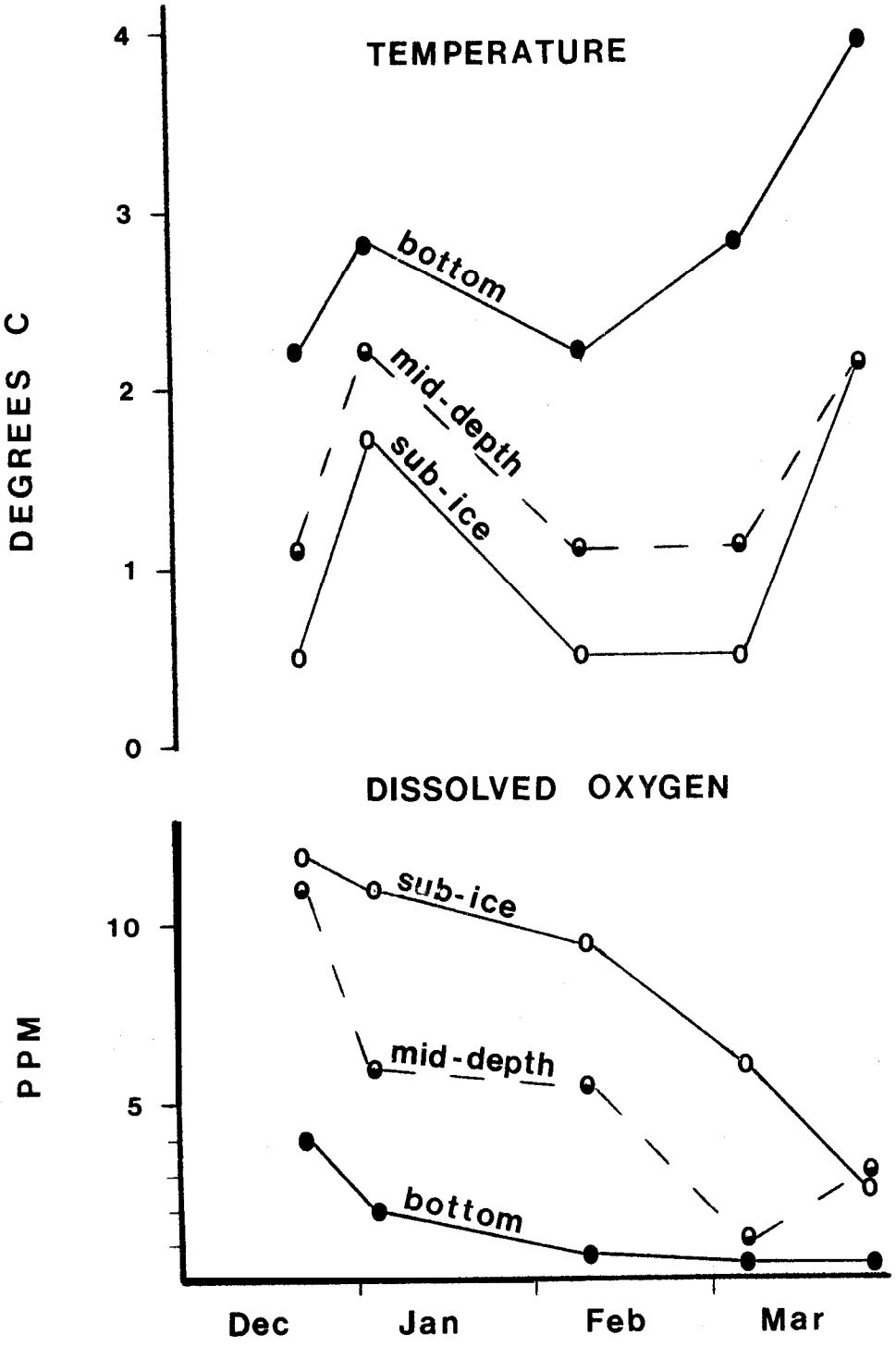

Figure 3. Water temperature and dissolved oxygen content under the ice on Henrys Lake at 0.5 km (0.3 mi) SSW of hatchery cabin #2, 1977-78.

Table 3. Estimated relative plankton abundance at three sample stations in Henrys Lake during the summer of 1977.

Organism	Sample date	Number of organisms/m of water column sampled			
		Goose Bay	Mid-lake	Near Staley Springs	Overall mean
Daphnia	6/20	119	246	128	164
	8/2	45	46	160	84
	8/31	62	194	373	210
	9/21	133	69	9	70
	Season mean	90	139	168	132
Diaptomus	6/20	70	48	30	49
	8/2	18	46	95	53
	8/31	141	0	88	76
	9/21	23	61	9	31
	Season mean	63	39	56	53
Cyclops	6/20	123	101	172	132
	8/2	9	6	80	32
	8/31	125	61	0	62
	9/21	133	0	179	104
	Season mean	98	42	108	83
Gloeotrichia	6/20	283	470	165	306
	8/2	3,616	2,164	1,093	2,291
	8/31	430	2,153	252	945
	9/21	0	0	0	0
	Season mean	1,082	1,197	378	886
Aphanizomenon	6/20	0	0	0	0
	8/2	0	0	0	0
	8/31	821	1,156	22	666
	9/21	916	- *	0	-
	Season mean	434	-	6	

*Abundant in thick mats which made quantitative sampling with a small net very impractical without many replicate tows.

The ice on Henrys Lake broke up 2 weeks earlier in the spring and formed 1 week earlier in the fall of 1977 than it had in 1976. No evidence of winter mortality was seen anywhere in the lake. The midge hatch was advanced by about 2 weeks in the spring, peaking near the first of June rather than in mid-June as it had in 1976. The damselfly hatch was also earlier than in 1976 and both it and the midge hatch appeared to be less abundant than in the previous year.

Survival conditions for trout under the ice in Henrys Lake appear to be worse this winter than in 1976-77 (Coon 1978). With lower water storage and heavier snowfall this is to be expected, However, the spring-fed areas and stream mouths where the fish congregate have remained quite adequate for trout survival and the open water areas at these points are now beginning to increase in size. Therefore, no significant winter nortality is expected this year.

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Analysis of Henrys Lake Cutthroat Trout

Richard L. Wallace
Department of Biological Sciences
University of Idaho

INTRODUCTION

Henrys Lake cutthroat, Salmo clarki, resemble the large-spotted Snake River cutthroat, the wide ranging subspecies presently found in most tributaries of the upper Snake River. The Yellowstone cutthroat also belongs to this group of cutthroat which has not yet been given formal subspecific designation. The original cutthroat in Henrys Lake probably resembled the Yellowstone cutthroat in appearance and morphology (R. J. Behnke, Colorado State University, personal communication). However, pure cutthroat native to Henrys Lake have never been analyzed to determine their meristic characters. Early reports show that rainbow trout (Salim gairdneri) and other types of cutthroat were stocked in Henrys Lake during the early 1900's and by the 1920's rainbow x cutthroat hybridization had already occurred (Anon. 1976).

The Idaho Department of Fish and Game stocked rainbow x cutthroat hybrids into Henrys Lake during the 1960's. By 1971, a concern had grown that the hybrid program was contaminating the cutthroat gene pool in the lake to the point that the cutthroat egg-taking program might become jeopardized. From 1972 to 1975 no hybrids were stocked. In early 1976, the Fish and Game Commission decided to return to the hybrid program at Henrys Lake and hybrids were again stacked in 1976 and 1977.

I have obtained ana analyzed samples of Henrys Lake cutthroat for three of the past four years. In addition, two samples of cutthroat originating at Henrys Lake and reared in northern Idaho have been analyzed. The rainbow trout influence on the cutthroat phenotype should have diminished during the period when no hybrids were stocked. the spawning run in 1977 should be composed of the "purist" cutthroat since hybrid stocking was reinitiated in 1960. A meristic characterization of cutthroat in the 1977 spawning migration could be used as a baseline or standard with which to compare samples taken in the future. Judgements could then be made concerning the effects of the hybrid program on the cutthroat trout phenotype.

A sample of 19 cutthroat were collected from the 1977 spawning run. Nine were judged "pure" and 10 were judged "hybrids". One additional specimen, believed to be an early maturing first generation hybrid released in 1976 (John Coon, Idaho Department of Fish and Game, Personal communication), also was collected. Meristic data collected from these fish were compared to data collected during previous years. In the following report, I:

1. Summarize all meristic data collected from Henrys Lake trout from 1970 to 1977.

2. Compare these data with those of rainbow trout and Yellowstone Lake cutthroat trout.

3. Characterize, morphologically, "pure" Henrys Lake cutthroat based on samples from 1974-1977.

4. Discuss the problems associated with field identification of "pure" cutthroat in the spawning run at Henrys Lake.

TECHNIQUES USED

Two samples of Henrys Lake cutthroat, which had been shipped to northern Idaho for rearing, were collected from the Rochat Ponds (St. Joe River). All other cutthroat analyzed were collected from the spawning run to the hatchery at Henrys Lake. All fish were placed immediately in 10% formalin or frozen until preserved.

Meristic analysis generally followed the procedures of Hubbs and Lagler (1958). Specific modifications were those of Behnke (1965) and Roscow (1974). Gill rakers, pyloric caeca, pelvic fin rays, basibranchial teeth and scales (above the lateral line and along the lateral line, two rows above) were counted. The fish were x-rayed and all centra, including the last three up-turned centra, were counted from the negatives. The samples are currently housed in the University of Idaho Fish Collection.

FINDINGS

Morphological characters of rainbow trout and Yellowstone cutthroat trout are listed in Table 1 for comparisons. The meristic data from 7 samples of Henrys Lake trout are compiled in Table 2. The 1977 sample differs morphologically from the earlier samples mainly in one character. All fish in 1977 had 9 pelvic fin rays, indicating a smaller influence from rainbow trout. The only trends I see from 1974 to 1977 is an increase in the number of basibranchial teeth and a reduction in the numbers of fish having 10 pelvic rays. All other features appear to vary only slightly and in no predictable manner. One perplexing feature of the 1977 sample is the rather low average scale count along the lateral line (156). I would have expected this count from these fish selected as "pure" to be higher, certainly higher than the same count for "hybrid" fish taken in the same year. That had been the case in the two earlier samples.

Rainbow trout influence on the cutthroat trout phenotype, although small, was still present in the 1977 sample. Fish with low scale counts (136, 141, 143, 148) and reduced basibranchial tooth counts (3, 7, 11) were found in the sample. The rest of the characters analyzed pretty well fall within the range expected of Henrys Lake cutthroat.

In Table 3, I have tabulated the meristic characters from five Henrys Fork rainbow trout collected in 1976. These fish were used as one source of sperm for hybridization in 1976. Also, I have included the data from one fish collected in 1977 that was believed to be a first generation hybrid. The meristic characters of the 5 fish are typical for rainbow trout (compare with data in Table 1). The hybrid is certainly different than other hybrids analyzed (Table 2). This fish was a mature male, 337 mm (13.3 in) TL, and had 10 pelvic rays, no basibranchial teeth, 54 pyloric caeca and 64 vertebrae, all rainbow characters. Cutthroat influence is indicated by the high scale counts.

As indicated earlier, the "pure" cutthroat collected in 1977 appear to me to still have some rainbow influence in the meristic characters analyzed (specimens with low scale counts and low basibranchial tooth counts). There-

Table 1. Meristic characters of rainbow trout and Yellowstone cutthroat trout. Typical sample ranges and means (in parentheses).

Species	Vert	Gill rakers	Pyloric Caeca	Scales LL & above LL	Pelvic rays	Basibr. teeth
Rainbow trout[1,2]	62-65 (63-64)	17-22 (18-20)	40-70 (50-60)	120-140 (125-135) 25-32 (26-30)	10	None
Yellowstonc 2 Cutthroat '	6o-63 (61.5)	18-23 (20.6)	35-50 (42)	160-190 (179) 36-48 (42)	9	10-4o (22)

[1] From Dr. Robert Behnke, Colo. St. Univ., personal communication

[2] From Roscoe (1974)

Table 2. Meristic characters of Henrys Lake trout, 1970-1977.

Species & source	Vert.	Gill rakers	Pyloric Caeca	Scales Lat. line	Scales above LL	Pelvic rays	Basib r. teeth
Rochat Ponds 1970-1974	6o-63	17-23	32-54	150-197	40-51	8-10	2-38
Composite n=31	X=61.9	X=19.8	X=41.6	X=172.9	X=45.6	X=9.1	X=24.3
"Pure" Henrys Lake 1974 (n=14)	-----	19-23 X=20.9	35-48 X= 39.9	149-185 X=165.0	38-46 X=41.4	9-10 X=9.1	9-33 X=19.4
"Hybrid" Henrys Lake 1974 (n=12)	-----	19-22 X=20.0	33-48 X=41.5	144-179 X=160.4	36-46 X=40.0	8-12 X=9.3	2-29 X=11.6
"Pure" Henrys Lake 1976 (n=13)	_60-62 X=61.6	19-23 X=20.4	33-46 X=37.8	148-180 X=166.2	34-44 X=40.2	9 X=9.0	4-37 X=22.8
"Hybrid" Henrys Lake 1976 (n=10)	61-62 X=61.5	19-22 X=20.3	36- X=40.0	143-173 X=160.5	37-50 X=42.3	9-10 X=9.2	11-45 X=26.9
"Pure" Henrys Lake 1977 (n=9)	61-63 X=62.0	19-22 X=20.4	30- X=38.1	141-181 X=156.1	35-54 X=40.0	9 X=9.0	3-38 X=22.3
"Hybrid" Henrys Lake 1977 (n=10)	61-63 X=62.2	18-23 X=20.2	36- X=40.9	136-177 X=163.2	35-46 X=40.0	9 X=9.0	11-51 X=25.8

Table 3. Meristic characters from 5 rainbow trout from Henrys Fork, 1976 and a first generation hybrid taken in the spawning run, 1977.

Species	Vert	Gill rakers	Pyloric Caeca	Scales LL & above LL	Pelvic rays	Basibr. teeth
Rainbow trout Henrys Fork 1976 (n=5)	62-64 X=63.2	19-20 X=19.2	51-67 X=58.8	126-1~+0 X=135.2 28-32 X=30.x+	10 X=10.0	None
Hybrid Henrys Lake 1977 (n=1)	64	21	54+	155 39	10	None

Table 4. Estimated meristic Characters for "pure" Henrys Lake cutthroat trout based upon 20 Selected fish, Henrys Lake, 1974-1977.

Species	Vert	Gill rakers	Pyloric Caeca	Scales LL & above LL		Pelvic rays	Basibr. teeth
Pure Henrys Lake Cutthroat (n=20)	60-62 X=61.6	_19-23 X=21.1	33-45 X=37.9	156-181 X=168.1	37-54 X=41.6	9	10-38 X=24.3

fore, I have selected 20 fish from the 1974 through 1977 samples that I feel have the least rainbow influence and calculated the range and average values for these characters (Table 4). This is my estimate of the meristic features of "pure" Henrys Lake cutthroat trout, based upon fish sampled and analyzed from 1974 to 1977. I think the count of scales along the lateral line is slightly low and still indicates some rainbow influence. This is not unexpected because there probably still is rainbow influence present in the phenotype of Henrys Lake cutthroat trout.

Based only on one fish, it seems that spotting pattern and the lack of basibranchial teeth could be used to identify first generation hybrids in the spawning run at the hatchery. There still appears to be no simple way to externally distinguish "pure" fish from hybrids other than those of the first generation.

Spotting pattern can be used and correct identification will be made most of the time. However, I believe that mistakes will be made when trying to select "pure" fish for spawning at the hatchery. In 1974, 3 out of the 14 fish selected as "pure" were definitely hybrids. Again in 1976, 3 out of the 14 fish selected as "pure" fish showed hybrid characters. In 1977, 6 out of the 10 fish selected as "pure" showed hybrid meristic characters. Once first generation hybrids appear again in the spawning run, identification will be easier, but it still seems that about 20-25% error will be made.

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Submitted by:

John C. Coon
Senior Fishery Research Biologist

and

Richard C. Wallace
Department of Biological Sciences
University of Idaho

Approved by:

IDAHO DEPARTMENT OF FISH AND GAME

Joseph C. Greenley, Director

Stacy Gebhards, Chief
Bureau of Fisheries

Jerry Mallet
Fishery Research Supervisor
Bureau of Fisheries